CLIMATE CONTROL METHOD

[0001] The invention relates to a climate control method as claimed in the precharacterizing clause of claim 1.

[0002] DE 43 31 142 C2 discloses a method by means of which the internal area temperature is always regulated to the nominal internal area temperature setting irrespective of the respectively prevailing temperature of the external area from which, for example, the internal area medium is taken in the case of a motor vehicle air-conditioning system, by appropriate adjustment of the temperature of the flowing-in medium. If required, the medium is cooled-down and/or heated for this purpose before flowing in.

[0003] In the case of vehicles with temperature and/or fan control, it is likewise known for the blowing-in temperature of the air-conditioning system to be calculated as a function of the outside temperature, the internal area temperature and a nominal internal area temperature setting.

[0004] However, the problem with climate control methods such as these is that, when the outside temperatures are very high, for example between 35°C and 55°C and/or there is additional solar radiation, a very low nominal blowing air temperature, for example -30°C to -60°C, is calculated. For physical reasons, specifically icing up of the vaporizer, the lowest blowing-in temperature is, however, about 3°C to 5°C. If an occupant wishes to be warmer, and changes the nominal value from 22°C to, for example, 24°C, the calculation of the nominal blowing-air temperature is increased only to about -10°C to -20°C. Since, however, the blowing-out temperature is physically limited to 3°C to 5°C, and a blowing air nominal temperature of down to -60°C is calculated, the nominal value change is not detectable for the occupant. The nominal value must be set even higher depending on the values of the control parameters, that is to say the outside temperature, the nominal value, the influence of the sun (the solar radiation) and the internal area temperature until a positive blowing air temperature is calculated by the climate control calculation.

[0005] One object of the present invention is to develop a climate control method such that the climate control responds immediately to a change in a nominal value even when the outside temperatures are very high and/or the solar radiation is strong.

[0006] According to the invention, this object is achieved by a climate control method having the features as claimed in claim 1.

[0007] The control system according to the invention makes it possible to achieve a detectable reaction to a manual action, that is to say the nominal internal area temperature is increased even though a nominal blowing-in temperature calculated for this nominal internal area temperature, in the same way as a previous nominal blowing-in temperature for a lower nominal internal area temperature, is not feasible owing to the physical limits and, conventionally, the lower limit value of the blowing-in temperature was used as standard in both cases.

[0008] In particular, the method according to the invention can also and in particular be used for multiple zone air-conditioning systems since more comfort for the individual seat positions can now be achieved in this case, since it is possible to adapt the blowing-in temperature separately for each area.

[0009] These and further objects, features and advantages of the present invention will become clear from the following description of one preferred exemplary embodiment, in conjunction with the drawing, in which:

[0010] Figure 1 shows a flowchart of the climate control method according to the invention.

[0011] Conventional climate control methods are subject to the problem that the blowing-in temperature $T_{blowing\text{-}in\text{-}min}$ cannot be below 1°C to 3°C owing to the physical limit of the vaporizer icing up, even though a calculated nominal blowing-in temperature would be considerably lower. Because of this, it is impossible, if the outside temperatures are high and/or the solar radiation is severe to provide a nominal blowing-in temperature $T_{blowing\text{-}in\text{-}nom}$ which is calculated as a function of the outside temperature T_A, the actual internal area temperature T_I and a nominal internal area temperature setting T_{Inom}. In a situation such as this, even in the event of a readjustment by increasing the nominal internal area temperature, it is possible for the nominal blowing-in temperature $T_{blowing\text{-}in\text{-}nom}$ calculated using the new nominal internal area temperature $T_{Inom\text{-}new}$ still to be well below the achievable value, as well. The occupant therefore cannot detect any control change, so that he requires several manual readjustment processes until he is provided with a blowing-in temperature $T_{blowing\text{-}in}$ which is comfortable for him. This is where the air-conditioning method according to the

invention comes into play, in order to provide a modified form of climate control in this case, with which this problem no longer occurs.

[0012] The climate control method according to the invention will now be described in the following text with reference to Figure 1, with this method allowing the problem described above to be overcome and allowing comfortable control for the occupant or occupants.

[0013] In the climate control method according to the invention, the conventional method is first of all used in a first step S1 to calculate the nominal blowing-in temperature $T_{blowing\text{-}in\text{-}nom}$ as a function of the outside temperature T_A, the actual internal area temperature T_I and the nominal internal area temperature $T_{I\,nom}$. Then, in a step S2, the calculation result, that is to say the nominal blowing-in temperature $T_{blowing\text{-}in\text{-}nom}$ is compared with the minimum physically achievable blowing-in temperature $T_{blowing\text{-}in\text{-}min}$. If it is found in the step S2 that the calculated nominal blowing-in temperature $T_{blowing\text{-}in\text{-}nom}$ is higher than the minimum blowing-in temperature $T_{blowing\text{-}in\text{-}min}$, conventional climate control is carried out in step S3, as a function of the actual internal area temperature T_I, the nominal internal area temperature T_{Inom}, the outside temperature T_A and, if appropriate, the solar radiation q, and the speed v, etc. If, in contrast, the calculated nominal blowing-in temperature $T_{blowing\text{-}in\text{-}nom}$ in step S2 is below the minimum blowing-in temperature $T_{blowing\text{-}in\text{-}min}$, a check is carried out in step S4 to determine whether there is a new nominal internal area value $T_{Inom\text{-}new}$. If there is no such value, an internal area temperature normal value, for example of 22°C, is used instead of this, and the process returns to step S1.

[0014] If there is a new nominal internal area value $T_{Inom\text{-}new}$, a nominal internal area temperature change Δt_{Inom} is then calculated in step S5 from the difference between $T_{Inom\text{-}new}$ and $T_{Inom\text{-}old}$. A check is then carried out in step S6 to determine whether the nominal internal area temperature change ΔT_{Inom} is greater than zero, that is to say whether the manual action should result in a temperature increase. If there is no temperature increase, that is to say the nominal internal temperature change ΔT_{Inom} is present, the process returns to step S1, otherwise it progresses to step S7. In step S7, a second nominal blowing-in temperature $T_{blowing\text{-}in\text{-}nom2}$ is now calculated as a function of the nominal internal area temperature change ΔT_{Inom} and the outside temperature T_A. The calculation is carried out with reference to empirical values determined by measurements for optimum control. A maximum of the nominal blowing-in temperature $T_{blowing\text{-}in\text{-}nom}$ and the second nominal blowing-in temperature

is then determined is step S8. A check is then carried out in step S9 to determine whether the second nominal blowing-in temperature $T_{blowing\text{-}in\text{-}nom2}$ has been chosen as a maximum. If this is the case, the outlet valve, in the case of several zones, the outlet valve in the respective zone, is closed in step S10. Otherwise the process returns directly to step S1.

[0015] In one preferred development of the invention, the climate control method according to the invention is used for multiple zone air-conditioning systems in such a way that the climate control process described above with reference to Figure 1 is carried out for each of the temperature preselection devices for the various zones as soon as the calculated nominal blowing-in temperature $T_{blowing\text{-}in\text{-}nom}$ is below the physically minimum possible blowing-in temperature $T_{blowing\text{-}in\text{-}min}$. This allows very comfortable climate control to be carried out separately for each separately air-conditioned vehicle area, so that occupants located in a different area are not also affected by the climate control, so that their comfort is not adversely affected either.